

Suitability of 'Guidelines for Screening of Prosthetic Candidates: Lower Limb' for Eastern Cape

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Declaration

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the authorship owner thereof (unless to the extent explicitly otherwise stated) and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

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Abstract

Background: Major lower limb amputation has a severe impact on functional mobility. While mobility can be salvaged with a prosthesis, it is not always the most optimal choice. It is often difficult to decide whether to refer someone for a prosthesis. An evidence-based prosthetic screening tool 'Guidelines for Screening of Prosthetic Candidates: Lower Limb' is used for prosthetic prescription in the Western Cape Province of South Africa.

Objectives: The study aimed to explore the suitability of the tool 'Guidelines for Screening of Prosthetic Candidates: Lower Limb' for use in the Eastern Cape Province of South Africa.

Method: A qualitative study was conducted with conveniently sampled occupational therapists (n=10), physiotherapists (n=12) and medical orthotists/prosthetists (n=6) in government employment in the Buffalo City Metro Municipality. Participants were trained to use the tool and then used it for four weeks. Their experiences of the tool were assessed through three focus group discussions. Emergent themes were identified during analysis.

Findings: Participants indicated that the tool could assist with prosthetic prescription, goal setting, communication and teamwork. They thought the tool was multidisciplinary in nature, comprehensive and practical. Findings showed challenges with regard to teamwork in the study setting. Resistance to change and a lack of time might hamper implementation of the tool. Participants suggested a longer test period, with structured feedback sessions, and supported by hospital management.

Conclusion: The tool can assist with managing the backlog for prostheses and to guiding prosthetic prescription in the Eastern Cape Province.

Key terms:

Lower limb amputation, prosthetic screening

Abstrak

Agtergrond: 'n Amputasie van die onderste ledemaat beïnvloed 'n persoon se funksionele mobiliteit drasties. Alhoewel 'n protese mobiliteit kan verbeter is dit nie altyd die mees optimale keuse nie. Dit is meermale moeilik om te besluit of iemand verwys moet word vir 'n protese. 'n Navorsings gebaseerde evalueringsvorm 'Guidelines for Screening of Prosthetic Candidates: Lower Limb' word gebruik vir die voorskryf van proteses in die Wes Kaap Provinsie van Suid Afrika.

Doel: Die doel van die studie was om vas te stel of die evaluering 'Guidelines for Screening of Prosthetic Candidates: Lower Limb' geskik is vir gebruik in die Oos Kaap Provinsie van Suid Afrika.

Metode: 'n Gerieflikheids steekproef van arbeidsterapeute (n=10), fisioterapeute (n=12) en mediese ortotiste/prostetiste (n=6), wat in die Buffalo City Metro Munisipale area vir die regering werk, het aan die kwalitatiewe studie deelgeneem. Die deelnemers het opleiding ontvang in die gebruik van die vorm, waarna hulle dit vir vier weke met pasiënte gebruik het. Hulle opinies oor die vorm is gekry tydens drie fokusgroep besprekings. Ontluikende temas is geïdentifiseer tydens data analise.

Bevindinge: Deelnemers het gevoel die vorm kan help met voorskryf van proteses, beplanning van behandeling, kommunikasie en spanwerk. Die vorm is multidissiplinêr, omvattend en prakties. Hindernisse ten opsigte van spanwerk is uitgewys. Weerstand teen verandering en tydsdruk mag gebruik van die vorm strem. 'n Langer toets periode met gestruktureerde terugvoer sessies, in samewerking met hospital bestuur, is voorgestel.

Gevolgtrekking: Die evalueringsvorm kan help met die hantering van die waglys, en leiding gee met die voorskryf van prothesis in die Oos Kaap Provinsie.

Introduction

The impact of a major lower limb amputation on an individual's functional mobility can be life altering (Marzen-Groller *et al.* 2008). A prosthesis can improve mobility, independence, safety and overall quality of life (Marzen-Groller *et al.* 2008; Taylor, *et al.* 2008; Mundell, *et al.* 2016). However, a prosthesis does not guarantee functional mobility and is not always the most optimal mobility device after lower limb amputation (Schaffalitzky *et al.* 2012). Non-and under-use of prostheses remain a challenge (Schaffalitzky *et al.* 2012). Many persons with lower limb amputations may benefit more from rehabilitation aimed at restoring mobility skills without a prosthesis, such as using a wheelchair or crutches (Condie *et al.* 2011).

The Eastern Cape Province has three Government-subsidised hospitals with orthotic and prosthetic services. There are about 25 medical orthotists/prosthetists (MOP) employed at these Hospitals. Currently in excess of 600 people are awaiting lower limb prostheses in the province. At the orthotics and prosthetics department in the study setting, in excess of 200 patients are awaiting prostheses. This backlog dates back to 2008.

Current practice in the study setting is to provide prostheses to those who access the department and enquire about obtaining one. Age, and the absence of co-morbidities, is used as selection criteria. Individual service providers use their discretion to decide whether to refer and/or issue a person with a prosthesis. This ad hoc practice might marginalise and discriminate against some patients. Challenges such as a lack of cardio-vascular fitness, breakdown of scar tissue or bilateral amputations sometimes lead to unsuccessful prosthetic fitting. In addition, due to the backlog, patients wait for long times to be fitted with a prosthesis. If the prosthesis is fitted after a long waiting period, muscle atrophy and physical deconditioning may occur, thus increasing the need for rehabilitation services

(which are scarce in the Eastern Cape) and negatively impacting prosthetic use and ultimate function (De Boer *et al.* 2011).

In the Western Cape Province of South Africa a prosthetic screening tool 'Guidelines for Screening of Prosthetic Candidates: Lower Limb'¹ (appendix 3) (PGWC 2010) is used to ensure that suitable candidates are referred for prosthetic consideration.

This study evolved to determine if this tool is suitable for use in the Eastern Cape Province.

Literature review

Lower limb amputation: An overview

Raya, Gailey, Fiebert and Roach (2010) suggested that amputation of the lower limb could be linked to altered health status. Quality of life among persons with major lower limb amputations is affected by the physical limitations, pain and emotional toll imposed by the loss of functionality and change in body structure (Godlwana, Stewart & Musenga 2012; Roth, Pezzin, McGinley & Dillingham 2014). Manderson and Warren (2010: 1419) define amputation as the archetypal impairment, because, 'it is highly visible, impacting markedly on the external appearance of the individual, his or her sense of well-being and self-image and, depending on the extent of the loss, the ability to undertake everyday tasks of personal maintenance'.

The primary cause of lower limb amputation in industrialised countries is peripheral vascular disease, which might or might not be complicated by diabetes mellitus (Manderson & Warren 2010). In Nigeria, the causes of lower limb amputations ranged from trauma, malignancies, gangrene and infection to vascular disease and diabetes (Kidmas, Nwadiaro & Igun 2004; Dada & Awoyomi 2010; Onyemaechi, *et*

¹ To be referred to as "the tool" in the text.

al. 2012). A study from Rwanda (n=107) found vascular reasons, which included diabetes, to be the most common cause of lower limb amputations in that country, followed by malignancies and trauma (Murwanashyaka, Ssebuufu & Kyamanywa 2013). No incidence figures could be found for South Africa or the Eastern Cape Province.

The three African studies found the average and/or median age of the person at the time of amputation to be in the mid-forties. The lowest was a median of 44 years (Murwanashyaka *et al.* 2013) and the highest was an average of 47.6 years (Dada & Awoyomi 2010). Due to the relatively young age at the time of amputation, and because one adult is often the sole breadwinner of an African family, lower limb loss with inadequate or no rehabilitation can lead to critical survival problems, these include serious economic crisis for the families (Kidmas *et al.* 2004). Kidmas *et al.* (2004) and Ennion & Rhoda (2016) argue that, despite the fact that amputations are often avoidable, surgeons in Africa are frequently left with no option but to amputate a limb to save a life. According to Kidmas *et al.* (2004) amputation remains a tragedy in developing countries because of poor rehabilitation.

Rehabilitation and teamwork

Robinson, *et al.* (2010) and Roffman, Buchanan and Allison (2014) argue that the multidisciplinary team is at the core of providing healthcare intervention after lower limb amputation. Optimal management of the long-term, often complex, conditions and co-morbidities associated with amputation cannot be provided by healthcare professionals from one profession only. Team members typically include a surgeon or rehabilitation consultant, prosthetist, physiotherapist, occupational therapist, nurse, social worker and the user's family and or caregiver (Manderson & Warren 2010). Furthermore management planning should be based on individualized goals (Robinson *et al.* 2010) developed by the team and patient. Team work in rehabilitation service delivery to persons with amputation is challenged in South

Africa due to a lack of coordination between interventions provided by service providers from different professional groups, poor communication among team members and a lack of resources (human and material) (Ennion & Rhoda 2016).

The decision about whether a person should be referred for a prosthesis and embark on prosthetic rehabilitation is a challenging one since possible post-prosthetic outcomes must be predicted based on pre-prosthetic function and ability (Gailey 2006). The monetary constraints, especially in developing countries, often rule out the possibility of trying first one and then the other option. Even while one of the primary goals of rehabilitation following lower-limb amputation is the successful fitting and use of a prosthesis to achieve functional mobility (Webster *et al.* 2012), some amputees may gain more benefit from therapy aimed at restoring adaptive skills without a prosthesis such as using a wheelchair or crutches (Condie *et al.* 2011).

Globally, prosthetic service delivery is challenged by factors like high costs. These challenges might negatively affect functional outcomes, socio-economic status and the quality of life of persons with lower limb amputations (Wyss, *et al.* 2015). Prosthetic service delivery in developing countries is hampered by additional challenges (Wyss *et al.* 2015).

Challenges to lower limb prosthetic service delivery in developing countries

Specific challenges related to prosthetic service provision in developing countries relate to the environment, employment and lack of services. Kam, *et al.* (2015) explored challenges to prosthetic services in low-income countries using semi-structured interviews with 11 conveniently sampled prosthetists (three were from African countries). The participants emphasised the barriers created by the diverse natural environments and climate. People often have to function in hilly, uneven, wet or dry terrain. Seasonal, climatic extremes in the same setting are common.

Prosthetic components must enable function in diverse environments as well as in occupations that require strenuous physical activity, such as farming (Kam *et al.* 2015).

Participants in the study by Kam *et al.* (2015) found that simpler prosthetic components, which required less maintenance, were better suited to the environments in developing countries (Kam *et al.* 2015). In developing countries, the most commonly used prosthetic foot is the Solid Ankle Cushion Heel (SACH) foot or variations thereof (Andrysek 2010; Pearlman, *et al.* 2008). The most commonly used prosthetic knee is the single axis hinge joint, which is inadequate for the requirements of walking over rough and/or uneven terrain (Andrysek 2010; Wyss *et al.* 2015). Stance phase stability is achieved through alignment of the knee joint and hip extension, which requires strong hip-extensor muscles and adequate hip extension range. Polycentric knee joints enhance both stance and swing-phase function and have been used with good outcomes in developed countries, but the increased costs and maintenance needs make them less suitable for these environments (Andrysek 2010). In developing countries, sockets are most commonly made from polypropylene (Andrysek 2010; Pearlman *et al.* 2008). Computer-aided design/computer-aided manufacture (CAD/CAM) systems allow prosthetists to obtain better-fitting sockets, but the cost of these systems is inhibiting widespread use in developing countries (Andrysek 2010; Pearlman *et al.* 2008). Socket-suspension is commonly provided through cuffs and belts rather than through suction (Andrysek 2010).

Distances, cost, and a lack of transport, as well as a shortage of healthcare and rehabilitation services and service providers, hampers ongoing access to essential services such as prosthetic fitting, repair and rehabilitation (Kam *et al.* 2015). Inappropriate surgical procedures that affect fit and fabrication of prostheses, poor continuation between levels of service delivery, and lack of knowledge about

rehabilitation services amongst users all cause challenges to service delivery to persons with amputations. Furthermore, the high patient numbers lead to compromises in quality of care; users are not adequately trained to function with the prosthesis. This leads to a decreased ability to participate in basic activities (Kam *et al.* 2015).

Three studies that provided information on rehabilitation after lower limb amputation in South Africa could be identified. Fredericks and Visagie (2013) described an outpatient rehabilitation programme for persons with lower limb amputations in the Western Cape province of South Africa based on data collected from service providers (2) and persons with amputations accessing the programme (n=30). The majority of participants received treatment once a week and a session lasted approximately 30 minutes. Transport costs and distance from the centre determined the number of sessions per week.

Ennion and Rhoda (2016) found that none of the three prosthetic users, from a rural KwaZulu Natal setting who participated in their study, received rehabilitation. They further describe a lack of stump preparation, prosthetic waiting periods of three years and poor functional outcomes. Staff shortages, a lack of resources, teamwork, and transport, as well as barriers in the natural environment and cultural factors negatively impacted rehabilitation service delivery (Ennion & Rhoda 2016).

The situation regarding rehabilitation for persons with lower limb amputations in South Africa is summarised as follows by Godlwana, Stewart and Musenge (2015: eS458) 'In Johannesburg, South Africa, patients with amputations do poorly postoperatively because the lower limb amputee population is underprivileged and hospitals are not able to offer long-term in- or out-patient rehabilitation.' If true for Johannesburg the biggest and most prosperous urban area in the country so much more for the Eastern Cape Province, a poor mostly rural province.

Prosthetic fitting

According to Table 1, prosthetic fitting rates differ widely between studies, ranging from 92% to 25.8%. Table 1 further shows that persons with above knee amputations generally had lower prosthetic fit rates than those with below knee amputations.

Table 1: Lower limb prosthetic fit rates

	Country	n	Fit rate	Additional information
Webster <i>et al.</i> (2012)	USA	75	92% one year post amputation	57% with trans-femoral amputation versus 93% with trans-tibial amputation were fitted
Roth <i>et al.</i> (2014)	USA	297	50.5% 6 months post amputation	
Mundell <i>et al.</i> (2016)	USA	93	25.8%	The study population comprise only persons with through-knee or trans-femoral amputations
Davie-Smith <i>et al.</i> (2016)	Scotland	1735	38%	72% with trans-tibial amputation versus 16% with trans-femoral amputation were fitted
Okenwa, Oeyichukwu & Cnevo (2015)	Nigeria	86	35%	

Prosthetic use

Of those that receive prostheses, not all remain prosthetic users. Roffman *et al.* (2014) found that 18% of 201 consecutively sampled participants from an American setting had become prosthetic non-users at 12-months follow up. Schoppen, *et al.* (2003) found in a cross-sectional study with 37 Dutch participants above the age of 60 years that 51% did not use their prosthesis functionally. A retrospective review of 56 Nigerian participants who had major, lower-limb amputations found that 93% did

not use their prosthesis. No information on reasons for non-use or what percentage of participants had received a prosthesis were provided (Onyemaechi *et al.* 2012).

Webster *et al.* (2012) found a mean prosthetic wearing time of 9.3 h/d. and a mean prosthetic walking time of 4.4h/d. Participants with trans-femoral amputations walked on average more than 4 hours less per day than participants with trans-metatarsal amputations (unfortunately the authors did not provide comparative information on the aspects between trans-tibial and trans-femoral levels of amputation). Furthermore, being older than 55 ($p=0.001$), having a major depressive episode ($p=0.001$) and a history of renal dialysis ($p=0.02$) was associated with shorter walking time per day (Webster *et al.* 2012). On the other hand, social support significantly improved walking time per day ($p=0.03$).

Predictors of prosthetic use

It is important that prosthetic use be predicted correctly, as it will influence function, rehabilitation and type of prosthetic components being prescribed. Mundell *et al.* (2016) explored pre-amputation characteristics that affected reception of a prosthesis in a cohort of 93 persons with through-knee or trans-femoral amputations. They found that participants who did receive prostheses were on average approximately 20-years younger (mean age 59 versus 78) than those who did not. The cause of the amputation also played a role; with 96% of those who had an amputation due to trauma and 71% who had an amputation for vascular reasons receiving prosthesis. Participants who used a wheelchair, or walked with a cane before the amputation were less likely to receive a prosthesis, as were those with cognitive impairments. Pre-amputation congestive heart failure, renal disease, cerebro-vascular disease and rheumatic disease did not impact on whether participants received a prosthesis or not. This study only reported on the reception of a prosthesis and did not assess prosthetic use or functional outcomes.

Davie-Smith, *et al.* (2016) also found increased age to be a negative predictor for prosthetic fit, as were bilateral amputations (24% with bilateral amputations were fitted versus 42% with unilateral amputations). Gender also played a significant role with significantly more men (63%) than women (11%) being fitted ($p=0.001$). Resnik and Borgia (2015) assessed the records of 7,690 Americans who had a major lower-limb amputation and similarly found that increased age and a trans-femoral level of amputation led to a decrease in prosthetic prescription. Other factors that negatively influenced prosthetic prescription were length of hospital stay, heart or renal failure, neurological conditions and living in a care facility. Being married was positively related to prosthetic prescription (Resnik & Borgia 2015).

Age (0.02) and the ability to balance on one leg 2-weeks post-amputation ($p=0.000$) were significantly correlated with prosthetic use in Dutch participants above the age of 60 at 1-year follow up (Schoppen *et al.* 2003). Yilmaz *et al.* (2016) found in a cross-sectional survey of 135 persons from Turkey with trans-tibial or trans-femoral amputations that being younger than 35 years is associated with higher levels of function ($p=0.001$). According to Roffman *et al.* (2014) amputation level above trans-tibial, use of mobility-assistive technology, and a delay in the reception of prosthesis, negatively impacted prosthetic use.

Kam *et al.* (2015) found that prosthetic use in low-income countries is dependent on prosthetic fit, comfort and durability. According to their participants, a comfortable prosthesis increases satisfaction, which in turn increases use.

Therapists who participated in the Western Cape study by Fredericks and Visagie (2013) indicated that they use age; physical endurance; the ability to walk with elbow crutches; muscle strength; cardio-respiratory fitness; and, the absence of neurological co-morbidities to determine if a patient is a prosthetic candidate or not. They did not provide objective parameters for any of these criteria (Fredericks & Visagie 2013).

Tools to predict lower limb prosthetic use

Publications from Ireland (Schaffalitzky, *et al.* 2011), the Netherlands (Van der Linde, *et al.* 2003) and the USA (Gailey 2006) argue that the decision to provide a prosthesis or not and what type of components to provide are usually based on clinical expertise and empirical knowledge. This knowledge is developed through in-service training, in clinical practice and by courses and symposia (Van der Linde *et al.* 2003). According to Schaffalitzky *et al.* (2011) the field of prosthetics is lagging in using evidence-based practice.

While clinical expertise can result in satisfactory prosthetic prescription, the choices are not motivated by evidence. Thus, variation in prescription as well as over- and under-use of prosthetic care might occur. The prescription process also lacks transparency for consumers and funders. Two international studies showed that in developed countries there are inconsistencies with regard to prosthetic prescription and lack of consensus amongst prosthetists on the probable outcome of amputees (Van der Linde *et al.* 2003; Schaffalitzky 2010). Standardised clinical guidelines, or a tool predicting prosthetic use, may result in more consistent and efficient clinical practice and thus more uniform, high-quality care (Van der Linde *et al.* 2003).

The essential ability of a prosthetic predictive tool must be to predict how well a person will walk with a prosthesis, without actually seeing the person walking, in a consistent and reliable manner. In addition, the tool must be clinically feasible and efficient regarding the time and resources it takes to complete (Gailey, *et al.* 2002).

Gailey (2006) concluded that, according to his research and current knowledge at the time, the Amputee Mobility Predictor (AMP) is the only assessment tool that has the ability to predict functional prosthetic ability. Van der Linde *et al.* (2003) on the other hand argue that additional research on prosthetic prescription tools is required.

Development of 'The Guidelines for Screening of Prosthetic Candidates: Lower Limb'

Bakkes (1999) used a cross-sectional survey to determine the variables that had a statistically significant impact on functional prosthetic ambulation. Study participants included persons with an above-knee amputation who received rehabilitation at a specialised rehabilitation unit in the Western Cape Province over a five-year period (n=60). She found that functional walking with an above-knee prosthesis is dependent on the ability to walk with crutches; a fully innervated amputation stump; of maximum strength; with full extension and adduction range of movement. In addition, stump length, shape and preparation as well as the person's pre-morbid level of fitness and co-morbidities played a role. Persons with amputations whose primary disability is compounded by age, associated disease and debility are more likely to have a limited use of prosthesis, walk shorter distances and require more assistive devices (Bakkes 1999).

'The Guidelines for Screening of Prosthetic Candidates: Lower Limb', (PGWC 2010) (Appendix 3) was based on this evidence. Face, content and predictive validity were taken into consideration in the development of the tool. It has since been used by various intuitions in the Western Cape Province. The tool was not tested for criterion validity, reliability, sensitivity and specificity.

In total 29 variables, which might affect prosthetic use, are assessed by the tool. The variables relate to cause, number and level of amputations (2), general health (9), expectations (1), mobility and balance (8), function (3), contra-lateral leg (1) and amputation stump (8). The tool is formatted in four columns (Table 2). The first column contains the aspect/variable to be assessed, such as aetiology. The second column is headed contraindication*/poor prognosis. The third column is headed negative predictor and the final one is headed positive predictor. For each aspect/variable a description is provided in the second, third and fourth columns as

shown in the example in Table 2. The assessor chooses an option. The number of ticks in each column is calculated to determine the scores. These scores allow the assessor to determine whether the potential user is a good candidate, needs intervention, or is not a prosthetic candidate, as shown in the final row in the example in Table 2.

Table 2: An example of the layout and contents of the tool

#Aspect/ standard	Contraindication* /poor prognosis	Negative predictor	Positive predictor
Aetiology	Any acutely terminal condition	Vascular or other progressive condition	Traumatic, congenital, orthopaedic or non-progressive condition
Number and level of amputations	Bilateral above knee amputations in adults	Above and below knee or bilateral below knee	Unilateral above or below knee
Co-ordination and mobility with crutches	*Cannot mobilise with elbow crutches	Achieves basic standard only. Reasons for poor function are to be addressed	Unlimited mobility with crutches and can negotiate all terrains including steps
Self-care	*Dependent	Any degree of dependence	Totally independent
Amputation stump: range	*Fixed flexion deformity of hip and/or knee	Any reduction in full range of hip and/or knee still to be addressed	Full range of movement with hip extension beyond neutral
Total score both pages			
Block in which highest score is obtained	Patient is not a prosthetic candidate. Reassess if factors are remediable. Put care plans into place	Remediate correctable factors through medical and therapeutic interventions	Potentially good candidate

#Only five of the 29 variables are presented in this example. For all variables and the complete tool, see appendix 3.

Rationale for selecting the tool under study

The only tool used to predict prosthetic ambulation, based on pre-prosthetic assessment that could be identified through published work, is the Amputee Mobility Predictor© (AMP). The Amputee Mobility Predictor was designed to measure an amputees functional capability with or without a prosthesis and to predict his/her ability to ambulate with a prosthesis. It can therefore be used before prosthetic fitting to predict functional mobility after prosthetic fitting (Gailey *et al.* 2002). While feasible, reliable, and valid the AMP was developed in a developed country (Gailey *et al.* 2002). Services, environments and prosthetic components (Andrysek 2010; Pearlman *et al.* 2008, Wyss *et al.* 2015; Kam *et al.* 2015) differ between developing and developed countries, as discussed earlier in this review. With this in mind, it was decided that a tool developed in South Africa that considers the local context might be more suitable.

In addition ‘The Guidelines for Screening of Prosthetic Candidates: Lower Limb’ (PGWC 2010) explores more diverse variables that might impact mobility with a prosthesis. The AMP focus on sitting, standing, balance and locomotion only, while ‘The Guidelines for Screening of Prosthetic Candidates: Lower Limb’ includes aspects like cause of amputation, co-morbidities, cognition, condition of the remaining limb and stump condition as well as balance and locomotor abilities. Unlike the Amputee Mobility Predictor, ‘The Guidelines for Screening of Prosthetic Candidates: Lower Limb’ not only measure if the patient will be a good prosthetic user but it provides a more holistic approach to the rehabilitation of an amputee. Scores when using ‘The Guidelines for Screening of Prosthetic Candidates: Lower Limb’ allow the assessor to determine whether the potential user is a good candidate, needs intervention, or is not a prosthetic candidate, as shown in the final row in the example in Table 2. Thus ‘The Guidelines for Screening of Prosthetic Candidates: Lower Limb’ (PGWC 2010) was used.

Aim

The study aimed to explore the suitability of the tool 'Guidelines for Screening of Prosthetic Candidates: Lower Limb' for use in the Eastern Cape Province of South Africa.

Objectives

- To determine if the tool gathers information on which prosthetic prescription can be based
- To determine if the tool is practical to use in the setting (time, cost, ease of application, understandability)
- To determine if service providers find the tool useful
- To determine if the tool can be used by various professional groups involved with prosthetic prescription

Methodology

Study design

A qualitative study was done where focus group discussions were used to explore professional's perceptions and opinions on the 'Guidelines for Screening of Prosthetic Candidates: Lower Limb' (PGWC 2010) specifically seeking to establish if they think it will be suitable for use in the Eastern Cape Province.

Preparation for the study

In order to find a way of addressing the huge prosthetic backlog and long prosthetic waiting times in the Eastern Cape Province I started to search for South African prosthetic prescription guidelines. During the first year of my master's program I

learnt that such a tool called 'The Guidelines for Screening of Prosthetic Candidates: Lower Limb' was used in the Western Cape Province.

I went to Cape Town and spent a month working at the Western Cape Rehabilitation Centre (WCRC) in order to familiarise myself with the tool, where the tool was used by the rehabilitation team to guide prosthetic prescription. I gained knowledge from the theoretical background of the tool, on how to use it and how to interpret the scores. I used the tool together with the physiotherapist working in the amputation clinic. During the final week, I was afforded an opportunity to use the tool alone and interpret my findings for the team.

I enquired about permission to use the tool in another province and in a research project. The Manager Medical Services; Western Cape Rehabilitation Centre, said official permission from the Provincial Government of the Western Cape was not required and gave me verbal permission to use the tool (personal communication with Dr Sammons, 4th of March 2015).

Study setting

The study was conducted in the Buffalo City Metro Municipality. Specific settings included Frere hospital (tertiary level of care), Cecilia Makiwane Hospital (secondary level of care) Empilweni and S.S Gida clinics (primary level of care). Frere Hospital is situated close to the East London central business district (an urban area). Cecilia Makiwane Hospital (CMH) is situated in Mdantsane, East London. Mdantsane is one of South Africa's peri-urban areas. Empilweni Clinic is situated in an informal settlement called Gompo, and services informal settlements like Ziphunzana, Duncan Village and many others. S.S Gida is situated on the outskirts of East London in a rural area and it caters mainly for people in the surrounding rural areas. The secondary and primary health care facilities chosen for the study are

the ones that normally refer patients to the orthotic and prosthetic department at Frere hospital for a prosthesis.

Study population, sampling and participants

Professional service providers who delivered rehabilitation services to persons with major lower limb amputations in the study hospitals and clinics formed the study population. These included orthopaedic surgeons, physiotherapists (20), occupational therapists (15), medical orthotists/prosthetists (6) and professional nurses.

Inclusion criteria

Professionals who provide services related to prosthetic mobility to persons who had major lower limb amputations.

Exclusion criteria

Professionals, such as social workers who might provide rehabilitation services to persons who had a major lower-limb amputation, but who are not directly involved with prosthetic prescription or rehabilitation.

Sampling

The sampling process was one of convenience and members of the study population were asked to volunteer to participate in the study. Information sessions were held by the researcher with the various professional groups, in April and May 2015, when the study was introduced and the role of prospective participants explained (See table 5 for an overview of the study processes). Those who were interested after this introduction were asked to participate in the study.

When the researcher contacted the professional groups to make appointments for the study's information sessions, the professional nurses and orthopaedic surgeons declined. The professional nurses indicated that, as a group, they do not play a role in prosthetic prescription and rehabilitation. A spokesperson for the orthopaedic surgeons explained that, since the physiotherapists and occupational therapists decided which patients are prosthetic candidates, they would not have any use for the tool. He further explained that due to a high turnover of junior doctors, it would be difficult to ensure continuity in the use of the tool and a challenge for senior doctors continually to train junior doctors in its use. Furthermore, in his opinion, this or any other tool is not the solution to prosthetic problems in the Eastern Cape Province. According to him, the major problem was related to how the prosthetic and orthotics departments are managed, coupled with a lack of provincial leadership in finding solutions to prosthetic problems.

Participants

This left the occupational therapists, physiotherapists and medical orthotists/prosthetists (MOP). Of them ten occupational therapists, 12 physiotherapists and six MOPs consented to participate in the study, meaning that a total of 28 people participated. Demographic and employment information of the study participants is presented in Table 4.

Table 4: Background information on study participants

	Occupational therapists (OT)	Physiotherapists (PT)	Medical Prosthetists/Orthotists (MOP)
N	10	12	6
Gender	All women	10 women 2 men	All men
Age range	23 – 34 years	22 – 42 years	27 – 56 years
	Employed at:		
Frere	8	6	6
Cecilia Makiwane	1	3	
Empilweni	1	2	-
S.S. Gida	-	1	-
In community service year	2	4	-

Study procedure

In June 2015, the individuals who consented to participate in the study after the information sessions received training in the use of the tool. During this training, the study was again explained to participants, any questions they had were answered and written and informed consent was obtained (Appendix 2). That was followed by an hour-long training session on the use of 'The Guidelines for Screening of Prosthetic Candidates: Lower Limb' (PGWC 2010).

The training mostly consisted of role-play where participants used the tool with each other. On the completion of the training, each participant received ten copies of the tool to use with patients. The participants were asked to try to use the tool with as many patients as possible, and to utilise the tool for a month. During this time, I was available to all participants should they want to ask questions. After three weeks of using the tool, I contacted each group and requested dates for the focus group discussions. Each group gave me a date, convenient to their working schedules, in the 4th or 5th week of using the tool.

Interview schedule

For data collection, an interview schedule was developed by me (appendix 1) that focused on addressing the objectives of the study. The main aspects included in the schedule were:

- General thoughts on the tool
- Usefulness of the tool
- Whether the tool assisted in identifying prosthetic candidates
- How difficult/easy the tool was to use
- Whether using the tool added to their work load
- Whether they thought the tool will benefit them and/or persons with amputations in the Eastern Cape Province
- Whether they would continue to use the tool

Data collection

Data was collected through three focus group discussions by an assistant and me; one with each of the professional groups who participated in the study.

The focus group discussions were held at the following:

- The Occupational Therapy department of Frere Hospital
The discussion started at 8 am in the morning and lasted about 20 minutes
The overall meeting took about 30 minutes
- The Physiotherapy department of Frere Hospital
The discussion started at 3 pm in the afternoon and lasted about 22 minutes
The overall meeting took about 45 minutes
- The Prosthetic and Orthotic department of Frere Hospital
The discussion started at 8 am in the morning and lasted about 15 minutes
The overall meeting took about 30 minutes

Therapists from the clinics and Cecilia Makiwane Hospital joined their colleagues at Frere Hospital for the focus group discussions. The focus group discussions were done in English and audio-recorded.

Data analysis

Thematic analysis was done according to the phases described by (Braun & Clarke, 2006):

- I familiarised myself with the data through transcribing and repetitive reading. During this process, initial ideas were captured.
- Initial codes were generated through identifying features of interest from the data
- Categories were developed by organising the identified codes into possible themes
- The themes were reviewed to determine if they were coherent, clear and distinct from each other
- The essence of each theme was defined and named

In the process of data analysis, I was assisted by my supervisor who independently analysed the focus group discussions and identified themes. A consensus was reached after comparing themes.

Table 5 provides an overview of the study as described in the methodology.

Table 5: An overview of study processes

Activity	Purpose	Duration	Date	Nr of times repeated
Visit WCRC	To familiarise myself with the tool	1 month	March 2015	1
Information sessions (Initial contact)	To introduce potential participants to the study and the tool To identify study participants	1 hour	April/May 2015	3
Training sessions	To train participants in the use of the tool	1 hour	June 2015	3
Participants use tool	To allow participants to gain practical experience of the tool	1 month	July 2015	
Collect data	To explore participants opinion on the tool	< 1hour	August 2015	3

Rigor

Data collected from the various professional groups was triangulated and the study supervisor independently verified the themes identified from the data to enhance credibility. I provided a detailed account of the methods used. Findings are supported with narrative examples from the interviews. The findings might be transferable to other similar settings. However, careful comparison of contextual factors must be done before recommendations are transferred.

Ethical implications

Permission from all the relevant hospital managers and the Department of Health in the Eastern Cape was obtained before the study commenced. The study was registered with the Health Research Ethics Committee at Stellenbosch University (S14/10/240).

The participants in the study will not benefit directly from the study. However, if the tool is found suitable they will be able to assess appropriately those patients who qualify for prosthesis. If the tool is found suitable patients should benefit through shorter waiting times and more appropriate referral, while the Department of Health in the Eastern Cape should benefit through better distribution of resources. No harm was done to any of the participants during the time of the study. No information that can be used to identify individual participants will be shared during data dissemination. Participation was voluntary and participants could withdraw from the study at any stage. No data was collected before written informed consent was obtained. Participant's also consented to the use of a digital recorder. Justice was ensured by not excluding any participant based on race, gender, language or ethnicity. All relevant professional groups were given the opportunity to participate.

Findings

Introduction

Generally, the tool was received favourably by the participants as summarised by this opinion: 'I think we should use it.' (Participant A, OT). However, some reservations and uncertainties were also voiced. Table 6 provides an overview of the themes and sub-themes that were identified during data analysis.

Table 6: Themes and sub themes identified from the findings

Theme	Subthemes
A compass in patient management	<ul style="list-style-type: none"> • Decisions regarding a prosthesis • Managing the prosthetic waitlist • Goal setting • Client communication and education • Referral
Characteristics of the tool	<ul style="list-style-type: none"> • Comprehensiveness • Feasibility • Format
Multidisciplinary nature	<ul style="list-style-type: none"> • Nature of the tool • Nature of the teams
Barriers to use	<ul style="list-style-type: none"> • Time constraints • Resistance to change
Application in the Eastern Cape Province	<ul style="list-style-type: none"> • A place for using the tool • Way forward

Theme 1: A compass in patient management

The findings showed that study participants thought the tool could be useful to provide guidance in the development of patient management pathways. Specific aspects in which the tool could provide guidance included direction on decisions regarding a prosthesis and managing the prosthetic waitlist, the setting of goals, client communication and education, as well as referral.

Decisions regarding a prosthesis

The medical orthotists/prosthetists were especially sure that the tool could guide prosthetic prescription.

‘The tool is very useful because it give a picture on how to select a patient [for prosthesis].’ (Participant B, MOP)

According to them, the tool fills an existing void.

‘...we do not have guidelines to select patients [for prosthesis]’ (Participant F, MOP)

It also deals with challenging areas.

‘For bilateral above-knee amputees the tool does give a clear indication.’
(Participant D, MOP)

One was more hesitant: ‘To some extent the tool does give an indication, but it needs to be worked out.’ (Participant B, MOP)

Uncertainty as to where the final decision rests was found amongst occupational therapists.

‘Who do you see as having the final say? Or does everyone have the right?’
(Participant E, OT)

A colleague responded.

‘I do not know. Because, who would generally do the case management for something like this? I would think it would have to be a doctor.’ (Participant B, OT)

Managing the prosthetic waitlist

Participants from all three focus groups agreed that the use of the tool might assist in addressing the challenge of the waitlist and long waiting times.

‘...the tool is a necessity to fight the backlog.’ (Participant A, MOP)

MOPs and physiotherapists felt one way in which the tool can assist in dealing with the backlog was through prioritising.

‘Yes, we do need the tool in order to be able to prioritise how patients get their prosthesis.’ (Participant F, MOP)

‘...you will be able to fast track patients who will benefit from things like this [prostheses].’ (Participant B, PT)

A physiotherapist explained further that in her opinion the tool might prevent the referral of people who are not prosthetic candidates.

‘...the waiting periods will be a little bit adjusted...you know a lot of the time you end up with 80 something year-old patients that all end up amputees and then they are the ones jamming the [wait] list, because the doctors referred those patients for prosthesis but they don’t even fit the criteria, those patients might never use those things. So you have a list full of patients, from maybe say 80% of them maybe 20% will actually fit the criteria to get a prosthesis.’
(Participant B, PT)

Use of the tool could also prevent prescription of prosthesis at an inappropriate time in the rehabilitation process.

‘...the patient was a poly trauma patient that had lost a limb through a crash injury...So 32-year old trauma patient had a humerus fracture, femur fractures ended up with...because he never went through physio or OT or anybody, stiff joint, stiff arm ligament from fracture, stiff...knee joint from the femur fracture coz he never saw physio, but that doctor still sent that patient - he is in a wheelchair - sent that patient to O&P to order prosthesis, because he thought that that patient would need one without any other intervention. The patient can’t even stand, can’t walk; he has never walked with crutches before.’ (Participant B, PT)

Guidance that will assist the team to refer only those who are prosthetic candidates at the appropriate time will in turn help to ensure that those who are candidates are assisted timeously.

‘...there is such a long waiting list there is not a clear plan of action; if you see someone for example having diabetes, 80 years old and etc. etc., and you know on top of that they still have to wait long, because they then get put on the back of the waiting list, because we have so many patients waiting for the prosthesis.’ (Participant A, OT)

A participant from the MOP focus groups summarises it neatly.

‘The tool is very useful to MOP’s because it eliminates unfairness to patients, so yes, the tool is needed.’ (Participant A, MOP)

Goal setting

The possibility of using the information in the tool to guide goal setting for future patient management was highlighted.

‘I think what is really nice about this tool is that if the patient is not currently; I guess would not at the moment be able to get a prosthesis that there is a plan of action a way forward for them. And I think that would be very nice as almost... so a way of getting someone who perhaps is in the middle to actually be a candidate for it.’ (Participant B, OT)

‘So anyone can then calculate the score. And then that would give you something to see that they [patients] would need rehab.’ (Participant E, OT)

Patient communication and education

Tying in with the setting of goals was the issue of patient education.

'I think it can be very like educational to the patients as well so that they can understand this is why you are not a candidate now. Let us work on these aspects and then they can take responsibility for their own rehab as well. Just yesterday, I issued a wheelchair to a patient that I thought would be a good candidate for this [assessing with the tool]. And he ask me about the legs, prosthetic legs, and he is like, "Those people say I am not ready, I can't yet." He did not know why he is not ready. He has diabetes that is all he knows and he knows that he must get it right but that is it. Lack of information to him because he could not explain to me 100% why is he not ready. He was just, "No, not now.'" (Participant A, OT)

Referral

A final use of the tool according to participants was that it could guide referral and thus enhance teamwork.

'If you see that this patient can be a good candidate but this patient has uncontrolled diabetes. So instead of sending the patient for prosthesis; to say: "I got a good score for this patient but the diabetes is poorly managed." So you then take your patient to the doctor; discuss your findings with the doctor, presenting the tool and the doctor says: "OK fine we will help manage the diabetes. Really it encourages the team".' (Participant F, OT)

This statement was met by indications of agreement such as 'yes', from three other focus group participants.

Theme 2: Characteristics of the tool

Comprehensiveness

In all three focus group discussions, participants pointed out that in their opinion the tool was comprehensive. The occupational therapists had no reservations.

‘I found it very comprehensive and I was really happy to see that it accommodates for activities of daily living... Like function.’ (Participant A, OT)

Some physiotherapists agreed and one indicated that it might be more comprehensive than current assessment tools used by them.

‘It’s nice that it elaborates more so it gives us a little more direction with the patients especially with their comorbidities; the medical aspects which we normally do not take into consideration.’ (Participant B, PT)

Another physiotherapist had reservations and felt the area of mobility is not subdivided into sufficient incremental steps.

‘It does not have an in between...there is just crutch walking and then wheelchair use. There is no mobilising with other assistive devices...Ok maybe the person walks with a walking frame this amount of distance...there is no place to score. Then they are scoring one, but they could be very good on a walking frame, just lack balance but then they do not fit on the scale at all...Because I was running it in the amp clinic when I was doing the patients in the amp clinic. Like a lot of them are on a walking frame and mobilise very well on a walking frame, but then they have either fear or balance issues, a lot of them has fear so the they do not want to progress to crutches then they do not really fit in there even though they can do a lot of the other stuff, they can

do standing independently, throw and catch a ball, but they don't fit in the walking section because there is only mobilising with crutches and they can't walk with crutches. So they score poorly there, which is only one segment...you know a lot of time with the prosthesis they look at crutch walking as the major, major thing.' (Participant A, PT)

Still on the topic of mobility the therapist pointed out an aspect that he felt were unclear.

'...they use basic standard only so what is a basic standard? It does not give you an idea what a basic standard is...' (Participant A, PT)

Feasibility

The opinion of participants on the user-friendliness of the tool varied. The consensus amongst occupational therapists was.

'It was easy to use, easy understandable.' (Participant A, OT)

Participants from the medical orthoptist/prosthetist focus group had some reservations.

'I understood the tool because it was explained, not easy to follow the tool if not explained.' (Participant F, MOP)

Format

The same ambivalence was shown regarding the format of the tool. While most participants felt it was easy to understand and follow, one or two did not agree.

'It is quite prescriptive so in that regard it will be quicker to fill out, because you can just read and you can see exactly what they want compared to like say if there is like a vague line and you think oh now I have to spent like

thinking what they actually want...it tells you exactly what they want to make it easier for persons to fill out...people will be committed, so they won't like get halfway, and oh I actually do not know the answer. They can just follow the tool and find the answer.' (Participant D, OT)

'Very simple to follow, user friendly, I don't think it would give you any problems because it is quit self-explanatory' (Participant B, PT)

The advantage of having the entire tool on one page was pointed out.

'...with the tool if everything is on one page it's simple...so it's not a burden...' (Participant B, PT)

Some participants from the MOP group had different views regarding the formatting of the tool.

'Not easy to follow the format of the tool.' (Participant F, MOP)

Theme 3: Multidisciplinary nature

Two subthemes i.e. the nature of the tool and the nature of the teams were identified.

The nature of the tool

The focus group participants agreed that amputee care requires a multi-disciplinary approach and that this must be facilitated within the team. A role they thought the tool could play.

'... if all of us can work together to see the patient as a whole be it OT, physio, doctor, we all come up with one understanding, we have one criteria we all follow the same set of rules...there is no blurred lines, no miscommunication.... it [the tool] address things like that' (Participant B, PT)

The overall view from the participants of all three focus groups was that the way in which the tool was crafted promotes collaboration between those involved in prosthetic management.

‘I thought it was nice that it was multidisciplinary just recognising that. That was really nice. I like it that way.’ (Participant B, OT)

‘I think it encourages great team work.’ (Participant A, OT)

Participants felt the tool must be completed by a team of healthcare service providers and not only one person or one professional grouping.

‘...the thing is we filling the whole form by ourselves, there is a section for doctors which they are supposed to be filling in, medical part of it, which we were trying to fill in all the info, because we doing it independently currently; not in collaboration with any medical practitioner. The overall concept was that it was gonna go into the patients folder, it was gonna go to the doctor, physio, OT so each person would fill in.’ (Participant B, PT)

The nature of the teams

In as much as the participants agreed on the multidisciplinary nature of the tool and the importance of teamwork they did identify challenges in that regard which might negatively impact the use of the tool in this setting. From the data, it seems that the various professional groups operated independently rather than in teams and no consensus was reached before prosthetic prescription.

‘...for here at the hospital we don’t have an understanding amongst all of us...the doctors are ordering, we [PT] are ordering, OTs are ordering, you guys are ordering [MOP]...no communication across all...a patient that was an amp, specific patient, where the doctor had gone over and above and had just ordered the patient a prosthesis without taking anything (emphasises)

into consideration, the patient was not mobilising, nothing! So he didn't follow any criteria at all" (Participant B, PT)

'...even after it was explained to him in detail [that the patient will struggle to use a prosthesis] he doesn't see it.' (Participant B & D together, PT)

The strong emphasis participants placed on the roles of individual professional groups might indicate a lack of role release that might further hamper teamwork.

'Clear distinction [should be made in the tool] to who should answer what questions e.g. mark where a doctor should fill, physio should fill etc.'
(Participant A, MOP)

'The community part, community integration, your housework, is there a self-care? Yes, that domestic activities, that is all occupational therapy, specific for us.' (Participant A, OT)

One participant suggested that the tool could be split into different sections to be completed by different professions.

'...there are some parts which are not really applicable for us. So if you split it up for like medical team people you fill in this part, OT's you fill in this part, physios this part.' (Participant C, OT)

A counter-argument was brought by another occupational therapist.

'I do not think it needs to be split specifically, because everyone can add their bit to each part. But there are definitely like certain things that the doctors will have to fill out and things that we would fill out, but I thought it was nice that it was multidisciplinary, just recognising that. That was really nice. I like it that way.' (Participant B, OT)

Theme 4: Barriers to use

While participants concurred on the positive aspects of the tool, they raised issues that might hinder successful implementation. The current nature of the team and teamwork, as described above, might cause a barrier to the use of the tool. Other barriers identified were time constraints and resistance to change.

Time constraints

Some participants felt that it took too long to complete the tool.

‘...the only thing that I can just imagine sometimes just with time management and the amount of patients we see I think sometimes it would be difficult to make such a comprehensive thing.’ (Participant B, OT)

However, the opinion that completing the tool was time-consuming was not shared by all.

‘Takes short time if the patients file is present to use the information to fill the place of doctors and physio if available.’ (Participant D, MOP)

Resistance to change

Participants in the occupational therapy focus group thought that general resistance to change might be a challenge in getting everyone to accept and use the tool.

‘New things to implement are generally a struggle, is it not?’ (Participant C, OT)

However, a colleague argued that the advantages of using the tool might break down this resistance.

‘Maybe because it is new... it will take like effort from people to fill it in initially, but then when they see it does work or you see results, when you see patients that do get [unclear] it will be better for them.’ (Participant B, OT)

Theme 5: Application in the Eastern Cape

Participants felt that there is **a place for using the tool** in the Eastern Cape Province.

‘Much needed guideline for our province’’ (Participant C, MOP)

And that they would use it.

‘I would [use the tool] as it is. Definitely.’ (Participant C, OT)

Others felt, some modification is needed.

‘The tool needs small instructions...e.g. explaining the meaning of the asterisks and other information...in order to understand it’ (Participant C, MOP)

Way forward

A further, longer trial-period with formal feedback sessions was suggested.

‘...like a practice run...similar to what we have done now...everyone tries it out and then you have meetings with all of them or different disciplines and then get feedback on what it was like...the pilot would be the best bet...come back to you; asking you the problem areas ...rectify any bumps in the road if there are any issues’’ (Participant B, PT)

The physiotherapists stressed the importance of obtaining managerial support.

‘Ya, you will have to approach high ups...’ (Participant D, PT)

They also believed that unity is needed for the tool to produce fruitful results.

‘The thing is it will have to be accepted across the board with everybody (emphasis) for it to be effective, because if not it’s pointless if just one group use the form.’ (Participant B, PT).

Discussion

In general, the findings indicate that the tool is suitable for use in the study setting. Participants indicated that they mostly found it comprehensive, practical and easy to use. They also agreed that the tool was multi-disciplinary in nature. According to them, the tool provided information on which prosthetic prescription could be based, but they were uncertain as to precisely how it could be implemented in their work settings and made some suggestions regarding formatting and content.

The tool states that an inability to walk with crutches is a contraindication for prosthetic prescription. In the clinical opinion of some participants, this places too much emphasis on crutch walking to the detriment of people mobilising with walkers or rollators. However, balance (Schoppen *et al.* 2003) and an upright posture are two features better facilitated by crutch walking, than by walking with a walking frame or rollator, and are essential for functional walking with a single-axis, above-knee prosthesis. Thus, it might be unwise to adjust the tool based on clinical opinion. Further evidence in this regard must be sought. In addition, should the person experience little trouble with the other aspects, the overall score will indicate that the person is potentially a good candidate for a prosthesis. This should prevent discrimination based on one aspect only.

The format of a tool impacts its user friendliness and thus the feasibility of using it in a specific setting (Martin & Kettner 2010). Some participants felt that the tool under study was easy to use and logical to follow. Others, especially amongst the medical orthotists/prosthetists, indicated that the tool is comprehensive, but might be

confusing and difficult to follow. One participant stated that he would have found it difficult to use the tool were it not for the training provided beforehand. The tool is on one page, an advantage pointed out by some. However, this makes for a densely covered page and a need to follow the rows carefully to ensure that all aspects are completed and counted. The comment that the asterisks used in the tool must be explained showed this challenge. (They are actually explained, but briefly). Thus, people who are unfamiliar with the tool might misunderstand or fail to see the explanation.

The physiotherapists also pointed out that, because the basic standard is not defined, the use of 'Achieves basic standard only', is unclear. This should be clarified. It would be helpful if, for instance, a definition is provided at the bottom of the page.

Narrative examples showed that professionals in the study setting apparently prescribe prostheses according to their discretion, with seemingly little or no consultation between members of the multidisciplinary team. Thus, in accordance with findings from international (Van Der Linde *et al.* 2003; Gailey 2006; Schaffalitzky *et al.* 2011) and other South African settings, (Fredericks & Visagie 2013) prosthetic prescription is based on clinical opinion. In the study setting, persons with amputations are managed in general surgical wards or as outpatients, rather than in wards or by teams dedicated to the care of amputees. This, in conjunction with the information from the surgeon that doctors rotate frequently, leaves one with the concern that not everyone who prescribes prostheses has sufficient experience in the management and rehabilitation of amputees to provide them with the expertise needed to do prescription.

Findings also showed instances of prosthetic prescription where the cause of amputation, co-morbidities, age and general physical condition were seemingly not taken into consideration. Evidence on the effect of these variables on a person's ability to function with a prosthesis is clear from previous studies (Roffman *et al.*

2014; Resnik & Borgia 2015; Yilmaz *et al.* 2016, Davie-Smith *et al.* 2016; Mundell *et al.* 2016 and Schoppen *et al.* 2003). The tool might therefore provide valuable guidance in this regard, because unlike the AMP it assesses whether co-morbidities are present, if these co-morbidities are managed and under control, and take the persons general physical condition into consideration.

When one considers the backlog of people waiting for lower-limb prosthesis, in the Eastern Cape Province, the urgency of finding a way to address the challenge is clear. Study participants felt that patients on the waiting list could be screened with the tool in order to determine whether they are prosthetic candidates, need further pre-prosthetic rehabilitation, or would gain more from another rehabilitation strategy such as wheelchair mobility. However, there is a need for caution. The backlog dates back as far as 2008 and patients who have waited for a longer period might be disadvantaged due to weaknesses that have developed post-amputation. De Boer-Wilzing *et al.* (2011) and Roffman *et al.* (2014) showed that long prosthetic waiting times negatively affect prosthetic use and function. In fairness, these people should be offered an opportunity to recover lost strength and rebuild capacity.

In addition to assisting with prosthetic prescription, participants felt that the tool could contribute to patient management at large. Some participants indicated that goals, referral and other management strategies could be based on the tool. While the tool can serve this purpose, it was not developed with a comprehensive assessment in mind. Many areas, which one would cover in a comprehensive assessment, are either not dealt with or dealt with superficially. It is in patients' interest to use the tool for its specific purpose, i.e. to determine prosthetic candidates or to identify areas that need to be addressed before prosthetic prescription, rather than as an overall assessment.

The current findings described, similar to Ennion and Rhoda (2016), a situation where teamwork was lacking, and communication between various professional

groups was limited. A lack of teamwork and role-release might have hampered participant's ability to use the tool optimally. Participants were concerned that they had to complete the tool individually and indicated that they could not complete certain sections, which could traditionally be seen as the role of another professional group. While the various aspects in the tool cover the terrain of several professional groups, the tool does not require in-depth information on any aspect. Every member of the team should be able to ask the patient the necessary questions, do the quick tests and observe the stump to collect the information needed to complete the tool.

Participants were also concerned about who should calculate the final score; or make the actual the decision on prosthetic prescription. There is no specific directive in this regard. The findings can be shared at a team meeting and a team or individual decision on prosthetic prescription can be made. Practical decisions and conclusions on the completion of the tool should be based on the specific circumstances and needs of individual teams and settings.

If the tool is to be implemented successfully in this or any other setting, it is essential that all professional groups base prosthetic prescription on the tool. If used by only some it will cause inconsistency in prescription, which in turn might lead to unfairness and inequity in patient management. Thus, it is necessary that service providers as well as provincial, district and hospital managers accept the tool and work towards its implementation.

Limitations

Due to the time limitations caused by the study being part of a structured master's course, the test period was short and not all participants had the opportunity to use the tool with patients. Not all focus group participants contributed equally. For instance, in the physiotherapy focus group, one member dominated. While she provided valuable information, it might be that the voices of others with differing

opinions were not heard. In retrospect I realise I should have tried to draw more information from other group members. It was unfortunate that the orthopaedic surgeons chose not to participate in the study as the findings showed that doctors *do* prescribe prostheses in the study setting. A further limitation was not inviting general and vascular surgeons to participate in the study.

Conclusion

The findings showed the haphazard manner in which decisions regarding prostheses are currently made in the study setting, and the lack of teamwork. The findings also showed that, in the opinion of study participants, the tool under study can assist with these challenges and especially to manage the backlog for prostheses and to guide prosthetic prescription, and that there is a need for such a tool in the Eastern Cape Province.

Recommendations

- The use of a clinical guideline for prosthetic prescription after lower limb amputation in the Eastern Cape is recommended. It is further recommended that the tool under study be implemented by the Provincial Government of the Eastern Cape for this purpose. A copy of the study findings will be submitted to the provincial government and discussions with heads of departments on the implementation of the tool are on-going.
- It is recommended that patients currently on the waitlist are assessed by service providers using the tool and that appropriate management strategies, in accordance with the findings, are implemented, the Frere Physiotherapy department together with the O&P Department are already using the tool in screening the waiting list of patients.
- It is recommended that the tool is validated, and tested for reliability, sensitivity and specificity in further research.

- Further study on the role that the ability to mobilise with a walking frame or rollator can play in predicting prosthetic functioning is recommended.
- The actual nature of teamwork in the study setting was outside the scope of this study, but findings showed challenges. It is recommended that teamwork in the setting is further explored and strengthening strategies are implemented
- It is recommended that the use of comprehensive assessment tools in the study setting is explored and that the teams consider implementing a comprehensive, multi-disciplinary assessment tool on which management strategies of patients with amputations can be based.

Future action

I have embarked on a process to implement the tool in the Eastern Cape Province with the assistance of the physiotherapists who participated in the study.

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Competing interest

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Appendix 1

Interview Schedule

Thank you again for participating in the study and using the screening tool. I want to talk to you about your perceptions of the tool

1. Could you tell me what your general thoughts on the tool were?
2. How useful did you find the tool?
Please explain your answer.
3. Did the tool assist you to know if the amputees were prosthetic candidates or not? Please explain.
4. Did you find the tool easy or difficult to use? Please explain.
5. Could you understand and follow the instructions on the tool? Please explain.
6. Did the tool cause an extra burden/create extra work? Please explain.
7. How much time does it take to complete the tool? Is that too much?
8. Do you think the tool will benefit the amputees and other professionals in the Eastern Cape Province? Please explain
9. Would you continue to use the tool? Please explain.

Appendix 2

PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM

TITLE OF THE RESEARCH PROJECT: Suitability of the tool; Guidelines for Screening of Prosthetic Candidates: Lower Limb for use in Eastern Cape Province

REFERENCE NUMBER: S14/10/240

PRINCIPAL INVESTIGATOR: Mduzana Luphiwo

ADDRESS: No 9 Bourbon Place, Winchester gardens, Amalinda East London

CONTACT NUMBER: 0847784176

You are being invited to take part in a research project. Please take some time to read the information presented here, which will explain the details of this project. Please ask the researcher any questions about any part of this project that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research entails and how you could be involved. Also, your participation is **entirely voluntary** and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the **Health Research Ethics Committee at Stellenbosch University** and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, South African Guidelines for Good Clinical Practice and the Medical Research Council (MRC) Ethical Guidelines for Research.

What is this research study all about?

A prosthetic screening tool to determine if persons with above knee amputations are suitable candidates for prosthesis is used in the Western Cape. This study aims to determine if the same tool can be used in the Eastern Cape. Twenty prosthetists, surgeons, physiotherapists, occupational therapists and professional nurses from tertiary, secondary and primary health care facilities will be asked to participate in the

study. All service providers who are eligible to participate in the study will be invited to a workshop where they will be introduced to the study and tool. Twenty participants will be selected from those who show interest to participate in the study. They will be asked to use the tool for a month. After one month the researcher will interview them to determine their opinion on the suitability of the tool.

Why have you been invited to participate?

You have been invited because you are a health care professional that provides rehabilitation services to persons with amputations and refer them for prosthetic legs.

What will your responsibilities be?

Your responsibility will be to use the prosthetic screening tool with every patient that had an above knee amputation whom you treat during the study month. While administering the tool you should reflect on its usefulness, cost, and ease of use and whether you think it suitable for use. After using the tool for one month you will be asked to share your thoughts on these aspects during an interview.

Will you as a medical professional benefit from taking part in this research?

You might be able to improve the service you deliver to persons who had above knee amputations.

Are there any risks involved in your taking part in this research?

There are no risks involved.

If you do not agree to take part, what alternatives do you have?

If you do not wish to take part in the study, you will still be able to see or use the prosthetic screening tool.

Who will have access to your medical records?

Not applicable.

What will happen in the unlikely event of some form injury occurring as a direct result of your taking part in this research study?

Not applicable.

Will you be paid to take part in this study and are there any costs involved?

No you will not be paid to take part in the study. The study will not require any extra costs from you.

Is there anything else that you should know or do?

You can contact the researcher Luphiwo Mduzana at 043 709 2075/2262 or at 0847784176 if you have any further queries or encounter any problems.

You can contact the Health Research Ethics Committee at 021-938 9207 if you have any concerns or complaints that have not been adequately addressed by the researcher.

You will receive a copy of this information and consent form for your own records.

Declaration by participant

By signing below, I agree to take part in a research study entitled: "Suitability of the tool; Guidelines for Screening of Prosthetic Candidates: Lower Limb for use in Eastern Cape Province"

I declare that:

- I have read this information and consent form or had it read to me and it is written in a language with which I am fluent and comfortable.
- I have had a chance to ask questions and all my questions have been adequately answered.
- I understand that taking part in this study is **voluntary** and I have not been pressurised to take part.
- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.

- I may be asked to leave the study before it has finished, if the study doctor or researcher feels it is in my best interests, or if I do not follow the study plan, as agreed to.

Signed at (*place*) on (*date*) 2005.

.....

.....

Signature of participant

Signature of witness

Declaration by investigator

I, **Luphiwo Mduzana** declare that:

- I explained the information in this document to
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I did/did not use an interpreter. (*If an interpreter is used then the interpreter must sign the declaration below.*)

Signed at (*place*) on (*date*) 2005.

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.....

Signature of investigator

Signature of witness

Appendix 3 GUIDELINE FOR SCREENING OF PROSTHETIC CANDIDATES:

LOWER LIMB

Patient:

Sticker Name
Address

Age _____

Date of assessment: _____ Seen by

Dr	Nursing	OPC	PT	OT	SW
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Signed:

Date and level of amputation(s)

Rehab to date (period and intensity)

Aspect/standard	Contraindication * /poor prognosis	Negative predictor/borderline candidate	Positive predictor
Aetiology	Any acutely terminal condition	Vascular or other progressive condition	Traumatic, congenital, orthopaedic or non-progressive condition
Number and level of amputations	Bilateral above knee amputations in adults	Above and below knee or bilateral below knee	Unilateral above or below knee
Substance abuse including smoking	Continues with habits post amputation	Has recently stopped (<2yrs) or has cut down but still continues to use substances	No substance (ab)use in the past two years
Ischaemic heart disease. ECG recommended in diabetics	*BKAs: Uncontrolled IHD AKAs or bilateral amputees: even if good compliance and controlled.	Good compliance and controlled (unilateral BKAs only)	No IHD
Cardiac failure	*Uncontrolled	Good compliance and controlled	No CCF
Diabetes	Uncontrolled	Good compliance and controlled	No DM
Hypertension	Uncontrolled	Good compliance and controlled	No HTN
Respiratory conditions (e.g. PTB, COPD, Asthma)	Uncontrolled	Good compliance and controlled	No past or current history
BMI	Underweight	Overweight	Within normal range
Continence	Incontinent bladder and bowel due to neurogenic causes	Other causes of incontinence	No bladder or bowel problems
Cognition (examine for stroke, head injury, multi infarct dementia)	*Poor insight, judgement and reasoning requiring supervision in daily activities	Limitations present but do not impact on activities of daily living	No cognitive fallout
Expectations	Unrealistic expectations of prosthesis, request for cosmetic prosthesis	Intermediate. Patient has not considered or is unaware of functional aspects of rehabilitation	Realistic expectations of prosthesis and role it has to play in complete rehab plan

Co-ordination and mobility with crutches (observation and history indicates ability to walk 200m with crutches)	*Cannot mobilise with elbow crutches	Achieves basic standard only. Reasons for poor function are to be addressed	Unlimited mobility with crutches and can negotiate all terrains including steps
Wheelchair use	*Only uses wheelchair	Uses wheelchair for community access or when bilateral hand function is required	None
Stand independently and throw and catch a ball 5 times, hop and perform functional activities standing on one leg	Cannot	Achieves basic standard only. Reasons for poor function are to be addressed	Achieves standard with ease
Stand on remaining limb for 40 min	Cannot	Achieves basic standard only. Reasons for poor function are to be addressed	Achieves standard with ease
Stand up from sitting without using hands	*Cannot	Achieves basic standard only. Reasons for poor function are to be addressed	Achieves standard with ease
Self care	*Dependent	Any degree of dependence	Totally independent
Domestic activities	Dependent	Any degree of dependence	Totally independent
Community activity: pre morbid and current	*None. Bed bound	Active in house	Scholar, employed or highly active in community
Remaining limb	Threatened remaining limb	Questionable viability or deterioration in viability in last 6 months	No problems. Good pulses and circulation
Amputation stump: range	*Fixed flexion deformity of hip and/or knee	Any reduction in full range of hip and/or knee still to be addressed	Full range of movement with hip extension beyond neutral
Amputation stump: power	*<4/5 hip extensors and abductors (BKA and AKA) and knee extensors (BKA). Patient generally weak	Good general strength but <4/5 hip extensors and abductors (BKA and AKA) and knee extensors (BKA). Shortcomings still to be addressed	5/5 all movements of hip and/or knee
Amputation stump: length AKA: 1/3 of opposite femur BKA: >12-15 cm from knee joint line	Markedly shorter with minimal fulcrum	Shorter than standard	Meets standard or is longer
Amputation stump shape and soft tissue	Poor compliance or response with coning and mobilisation of soft tissues. Persistent dog ears and hard spots	Improvement in shape evident or anticipated. Surgical intervention considered	Conical form
Amputation stump: bony prominence causing soft tissue tension	Un-correctable	Amenable to coning or surgery correction	No bony protuberances
Amputation stump: Wound healing	*Open wound, draining sinus	Healed but immobile scar	Healed and mobile scar
Amputation stump: skin condition	Thin skin or easily abrades with compression bandage Skin graft on weight bearing area	Healed skin grafts	Healthy, supple and flexible skin with no skin grafts on stump
Amputation stump pain/sensation	*Ischaemia	Neuroma, hypersensitive stump. Phantom pain impacting on function	No pain. Phantom pain not impairing function
Total score both pages			
Block in which highest score is obtained	Patient is not a prosthetic candidate. Reassess if factors are remediable. Put care plans into place	Remediate correctable factors through medical and therapeutic interventions	Potentially good candidate

